Outer front cover: Photograph of the antennas of the DOSAAF/USSR Central Reception/Command Point for operating the "Radio" radioamateur satellites.

Inner front cover /full texts/: NEW GENERATION OF "RADIO" SATELLITES

The new generation of "Radio" satellites is another convincing proof of the inexhaustible possibilities of radioamateur creativity. These satellites were made in the DOSAAF/USSR Laboratory of Space Technology, in whose work constructor-enthusiasts from various cities of our country participate. The satellites have a wide range of operating possibilities (see article on pp 2 - 4).

In our pictures:

Outside view of a new-generation "Radio" satellite.

In the center (left to right): Technical project leader A. Skorokhodov, Chairman of the FRS/USSR /Federation of Radiosport of the USSR/ Satellite Communication Committee B. Chirkov and the deputy technical project leader B. Lebedev. 1/

Bottom: Training operations for operators at the DOSAAF/USSR Central Reception/Command Point.

Photos by M. Anuchin and B. Vorsanov

p 1: TASS ANNOUNCEMENT - "RADIO" SATELLITES IN FLIGHT. /Same announcement as that translated in full at top of p 2 of translation RADIO #12/1981./

p 1: Congratulatory message to the employees of the DOSAAF/USSR Space Technology Laboratory from L. S Demin, G. V. Sarafanov, Yu. V. Romanenko, V. A. Dzhanibekov, flier-Cosmonauts of the USSR and radioamateurs. /Translator's note: The Soviet terms "amateur radio" and "radio amateur" have broader meanings in the USSR than we are accustomed to. The fact that the four named cosmonauts are identified as radioamateurs does not necessarily mean that they are licensed amateurs with call-signs./ The message recalls Soviet contributions in the fields of short-wave and satellite radiocommunication and expresses the wish that the enthusiasts of radiotechnology will remain in the front ranks of scientific-technical progress

pp 2 - 4: "Satellites of the New Generation," by A. Grif and A. Gorokhovskiy. /Summary translation unless text appears in quotation marks. - Tr./

The improved equipment aboard the new radioamateur satellites is convincing testimony to the growing interest on the part of amateurs in the Soviet Union in the problems of opening up the portion of space near Earth, and to their inexhaustible creative talents. Some history: Following the launch, nearly a quarter century ago on 4 October 1957, of the first Soviet artificial Earth satellite, thousands of shortwavers and ultrashortwavers, at the call of the USSR Academy of Sciences, engaged in voluntary monitoring of its signals. Ten thousand hams took part in these observations, sending in over 30,000 reports on 200 km of magnetic tape and permitting the experts to make important scientific conclusions on radio-wave propagation for space-to-Earth paths. The launching of the first educational-experimental satellites of the "Radio" system represented a distinct new step. A group from RADIO magazine initiated the idea. An organizing committee was set up in 1975 attached to the RADIO editorial board, composed of scientists, radiospecialists, and representatives from the USSR Federation of Radiosport, the Central Radio Club of the USSR Named After E. T. Krenkel', and creative collectives of radioamateurs and students of higher educational institutions. In three years space repeaters and Earth control and command points were created at the Public /? - Obshchestvennaya/ DOSAAF/USSR Space Technology Laboratory and the "Iskra" Student Construction Bureau of the Moscow Aviation Institute Named After S. Ordzhonikidze, with participation by DOSAAF radioamateurs from Kaluga, Molodechno, Primorskiy kray, and Moscow oblast'. The Radio-1 and Radio-2 satellites (registration symbol RS) were placed in a near-circular orbit with a single launcher 26 October 1978 together with Kosmos-1045. Their period was 120.4 minutes, average distance of the Earth's surface about 1700 km, and inclination 82.2°. Twenty thousand two-way contacts were carried out via Radio-1 and Radio-2, with shortwavers from 70 countries reporting contacts. A maximum distance of 8000 km was achieved, using Earth stations with powers not exceeding 5 to 10 watts. The launch and the experiments proved the possibility of radioequipment operating in open space, without

1/ Boris M. Lebedev, UA3ADI.

hermetically-sealed components. Operation of the satellites demonstrated the correctness of the technical solutions concerning their construction as a whole as well as the repeater, telecommand, telemetry, and energy systems. The possibility was confirmed in practice of simultaneous access by many amateur stations for operation via an on-board repeater. During the period of operation it was possible to evaluate with a fair amount of precision the energetics /??? - energetika/ of the radio link Earth - RS - Earth. It turned out that the possibilities offered by the on-board reception-transmitting equipment and the efficiency of the antennas of the "Radio" satellites were higher than those of the analogous satellites in the "Oscar" series. This permitted carrying out communications with record-breaking low power in the Earth stations. By way of example one may cite a QSO between the radiostation of the Central Reception-transmitting Point and radiostation G3IOR (Great Britain) several thousand kilometers away, both stations having transmitter powers of the order of 30 - 50 mW. The creation of the "Radio" series of satellites stimulated the construction of original amateur Earth equipment. At the "Telecom-79" exhibit in Geneva, "Svyaz'-81" in Moscow, and at the 30th All-Union Exhibition of the creations of radioamateurs-constructors, table and portable models of retransceivers for communication via amateur satellites were demonstrated. The results achieved with "Radio-1" and "Radio-2" made possible crossing over to a new stage -- the organization of a continuously operating system of amateur communication based on satellites of a new generation.

DOSAAF

THE "RADIO" SERIES OF SATELLITES OF THE NEW GENERATION

The new-generation satellites are calculated to provide 20 duplex telephone channels, operating on single sideband without carrier, or 80 telegraph channels, for sound reception. Amateur teletype channels may also be arranged. The on-board equipment features wide use of microelectronics. Its basis is a multifunction radiotechnical complex permitting the active retranslation of signals from amateur stations in the ultrashortwave band, the transmission of circular announcements, the establishment of two-way radioamateur communication with an automatic answerer -- an automatic operator (robot), the transmission of telemetry information, and command of on-board equipment by a radio command link. /End page 2./

"A fundamental distinction between the "Radio's" of the new generation and previous Soviet as well as foreign amateur satellites, is that they have installed on board an automatic answerer wich which radioamateurs may conduct communications."

"The automatic answerer is a highly qualified "radiooperator." It remembers the call= sign of an amateur station, gives the other operator a control number, and if necessary asks for a repeat of a call. The robot can also require the speeding or slowing down of the speed of transmission or indicate that the calling procedure followed has been incorrect. It can keep in its memory ("on-board log") up to 64 call-signs of operators with which it exchanges radiograms. The whole list of call-signs, on command from the control point, is transmitted to Earth."

"Microelectronic instruments made possible the creation of one other interesting automatic device -- the "bulletin board," consisting of a memory device intended for transmission from on board the satellite of circular announcements. Information necessary to radioamateurs and arriving from the Earth point is inscribed on the "board" -- for example concerning the satellite's operating timetable or its orbital parameters. The capacity for such information is 20 words of 5 letters or numbers each. The inscribed announcement may be transmitted to Earth continuously, with specific pauses, or on command from the command point."

"The operation of the on-board radiotechnical complex is explained by the schematic diagram shown in fig. 1. Signals from Earth stations (from the Central Reception/Command Point, peripheral Reception/Command Points, or radioamateur stations) are received by two sets of reception antennas, A1 and A2, operating in parallel. Through a tuning mechanism they reach antenna amplifier AU and then the receiver Pr of repeater RTR. Here they are divided into three channels. If they are signals from amateur stations (repeater channel RTR), they are routed, after reformulation /??? - preobrazovaniye/, to transmitter Prd and via transmitting antenna A3 are transmitted to Earth. Low frequency filter FNCh, located in the circuit of the transmitting antenna-feeder device, serves to distinguish /??? - razvyazka/ between transmitted and received signals. The output power of the repeater is 2.5 Watts when the repeater frequency band is fully loaded."

"The command signal transmitted from the Central Reception/Command Point on radio command link channel KRL enters decoder Dsh in the on-board command complex BUK from the output

of the repeater receiver. From the output of the decoder the command signals are directed toward the executing systems."

"Signals from robot channel R go from the receiver to the input of automatic answerer AO (automatic operator). They are analyzed and if they correspond to the parameters built into the logic of the equipment then a contact is made with the other operator. Information to be inscribed in memory divider ZU ("bulletin board") enters on the same channel. Operation of the automatic answerer or of the memory device takes place on a corresponding command from the Command Point."

"Included in the tasks of the transmitter is the transmission of the repeater signal, the answer of the automatic operator, circular announcements from the "bulletin board," and beacon signals. Telemetry information is transmitted on the beacon frequency."

"Power for on-board equipment is supplied from chemical batteries KhB, the charging /podzaryadka/ of which is accomplished with solar batteries SB."

"The on-board command complex operates in accordance with a broad program. After the placing of the satellite in orbit it ensures the separation of the satellite from the carrier rocket and the opening up of the transmitting antennas. In flight the BUK functions on commands from Earth. Depending on the loading of the repeater, the operation mode of the satellite with respect to energy consumption is established, and the repeater, automatic answerer, and "bulletin board" are switched on or off. By and large the on-board command complex executes 56 commands."

"A large group of commands is intended to control the telemetry system TLM. Among its functions are the control of the technical status and of the operational readiness of on-board equipment and of the satellite as a whole."

"The on-board telemetry system includes a telemetry bloc TLM and a set of meters /??? - datchiki/: Parameter control of the equipment in the radiotechnical complex, control of the power-supply system, temperature control, and pressure control."

Telemetry information begins to be sent when the on-board transmitting antennas are opened up and continues throughout the life of the satellite. The telemetry device takes information from the meters in turn, encodes it, and in the form of telegraphic Morse code sends it to the keyer of the generator of beacon M /??? -- not at all sure of meaning of this sentence - Tr./ The telemetry information is given in 35 channels, consisting of five groups of 7 channels each. The first group is the basic one, giving information on the main parameters: The output power of the repeater, the temperature of the radiator of the output stage of the repeater, a telemetry test of the radio command link, the voltage of the load, current of the load, temperature of the radiator in the stabilization bloc, and gas pressure in the hermetically-sealed container. The first group is included in every telemetry report. Transmission of groups is carried out cyclically. Each parameter is transmitted with four characters: Two letters (the first gives the number of the group, the second the position of the parameter within the group) and two numbers (the numerical value of the parameter from 0 to 99).

In case of need it is possible to switch on or off, on the radio command link, the transmission of any group of information except the first. It is also possible to "stop" computing /?/ and in this event only one parameter will be transmitted. This is important, for example, when it is necessary to conduct an uninterrupted lengthy control of the operation of, say, the output power of the repeater and also when carrying out various experiments. So, based on the continuously received data on the current in the solar batteries one may indirectly judge its illumination, and consequently the speed of the rotation of the satellite around its own axis or its orientation in space. The time for querying /?/ all 35 channels is 80 to 120 seconds, and the meximum error plus or minus 10 mV in a measurement interval of 0 to 1 V /???/. One feature of the telemetry system is that telemetry information l may be received on an ordinary amateur receiver, permitting literally thousands of radioamateurs to be in space as it were. The lay-out of the basic q equipment in the satellite is shown in fig. 2. /End of page 3 of original article./

"The new generation of "Radio" satellites is designed for a longer period of operation than were the first educational-experimental satellites of 1978. The power-supply system, including solar batteries and chemical sources charged from them, should ensure a lengthy period of active existence."

"The on-board repeaters are designed for operation in three groups -- I, II, and III -- of nominal frequencies, as shown in fig. 3. Here RTR is the basic repeater frequency band, M is the frequency of the beacon, and R that of the automatic answerer.

"CONTROL OF THE SATELLITES"

"Control of the satellites may be performed from the central or peripheral DOSAAF/USSR reception/command points. The systems at the Earth points have been substantially upgraded."

The equipment at the Central Command Point produces command signals and transmits them to the satellites. There is also equipment for conducting communication sessions via the on-board repeaters, for communication with the robots in the satellites, the recording of circular announcements in the "bulletin board," and the read-out of information /???/ recorded in the on-board log. An important part of the equipment is a device for the reception and recording of telemetry information; this permits one to make an objective judgement as to the state of the on-board equipment and the satellite as a whole, and of the radio control of the satellite orbits. Communication between the Central Command Point and the other command points may be made via amateur stations located at the CCP, and also via the inter-city telephone network.

The control position is the "brains" of the CCP. From it the necessary manipulations are made to control the equipment at the CCP and on the satellites. To increase the reliability of transmission of commands and of the carrying out of contacts, the CCP has basic and reserve transmitters, the outputs of which can be switched to one of four transmitting antennas. Three of these antennas have circular polarization and the fourth (the one on the cover) is a directional four-turn /chetyrekhvitkovaya/ spiral with a reflector.

For observing the satellite signals and for carrying out communications via the satellites at the CCP, there are four receiving positions and one control position. The receivers are connected to receiving antennas through three broad-band antenna amplifiers and a switching system. The use of a whole complex of receiving antennas having differing but continuous directivity toward the azimuth, non-directional antennas, and also directional antennas situated together with directional transmitting antennas permits a very effective use of pass times. For the recording of signals received from the satellites tape recorders and an undulator /??? -- ondulyator/ are used. There is also a display that recognizes telegraph signals and puts them up in the form of alpha-numeric text.

pp 14 - 15: CQ-U.

INFO*INFO*INFO.

Radio prizes to best all-around shortwavers. Based on participation in national shortwave 'phone and c.w. championships last year, RADIO has awarded prizes to the following: G. Rumyantsev, UA1DZ (score of 5 -- he was third in the 'phone championship of the USSR and second in c.w.), UAØQWB (7 -- 1st and 6th), UB5LAY (10 -- 6 + 4), and UM8MAO (12 -- 11 + 1). Among collective stations UK6LAZ had a score desiring from taking second prize in both championships, putting it 10 points ahead of the nearest runners-up (UKØFAI and UK5IBM). Observer S. Dezhurnyy, UA3-121-1567, of Voronezh, won in that category.

Diplomas. An "Ashkhabad" diploma (certificate) has been established in honor of the city's hundredth anniversary, by the Federation of Radiosport of the Turkmenistan SSR and the republic DOSAAF sport-technical-sport club. The address given is 744020, Ashkhabad-20, abonementnyy yashchik 555, RSTK DOSAAF TSSR, in English roughly Republic Technical-sport Club, P. O. Box 555, 744020 ASHKHABAD-20, USSR.

Achievements on the 160-meter band. The editors of RADIO plan to publish tables regularly of achievements in this band, based on the R-100-O listing and on QSO's confirmed by QSL's. Separate tallies will be kept of Ist-category shortwave stations, IInd and IIIrd-category shortwave stations, ultrasbortwave stations (RA), beginners (EZ), and collective station teams. For the first table radioamateurs are requested to send in their achievements not later than 1 March.

(to page 7)

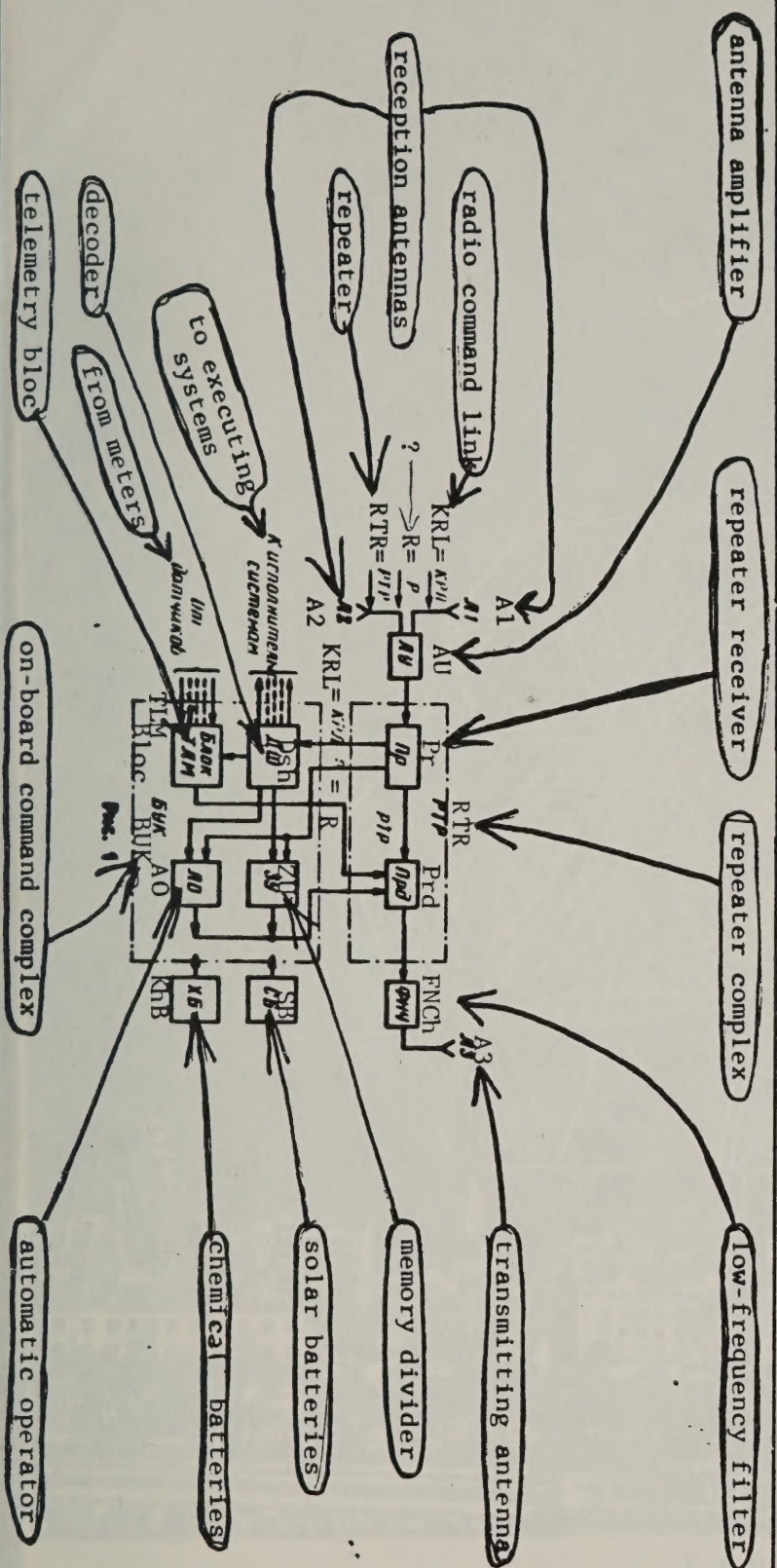
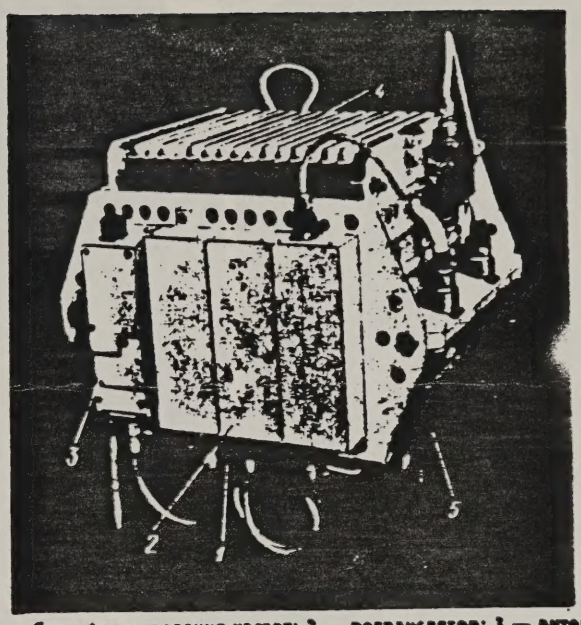


Fig. 1

1 - frequency generation unit;
2 - repeater;
3 - antenna amplifier /pre-amplifier?/
4 - on-board command complex;
5 - low-frequency filter



1 — блок формирования частот; 2 — ретранслятор; 3 — антенный усилитель; 4 — бортовой управляющий комплекс; 5 — фильтр нижних частот

Рис. 2

Fig. 2

(PTP = repeater)

Receive frequencies for on-board repeater

Transmit frequencies for on-board repeater

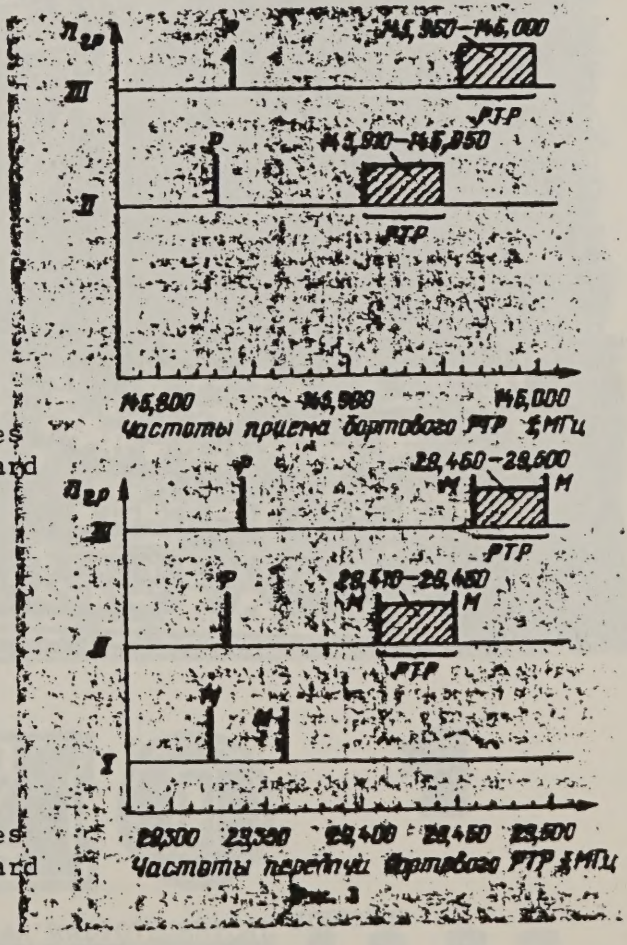
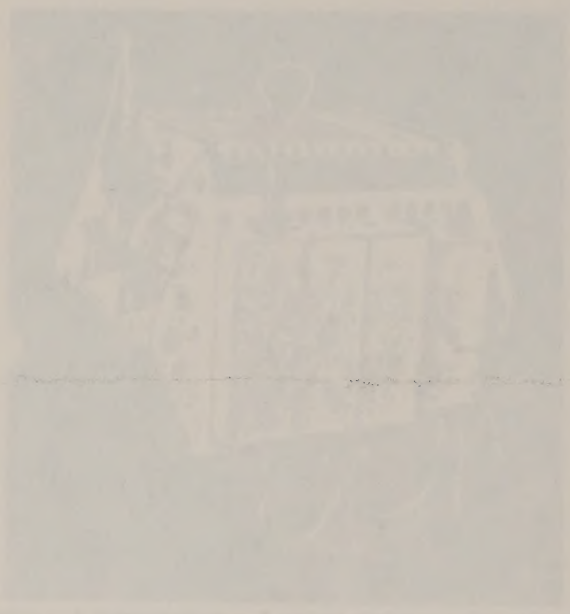
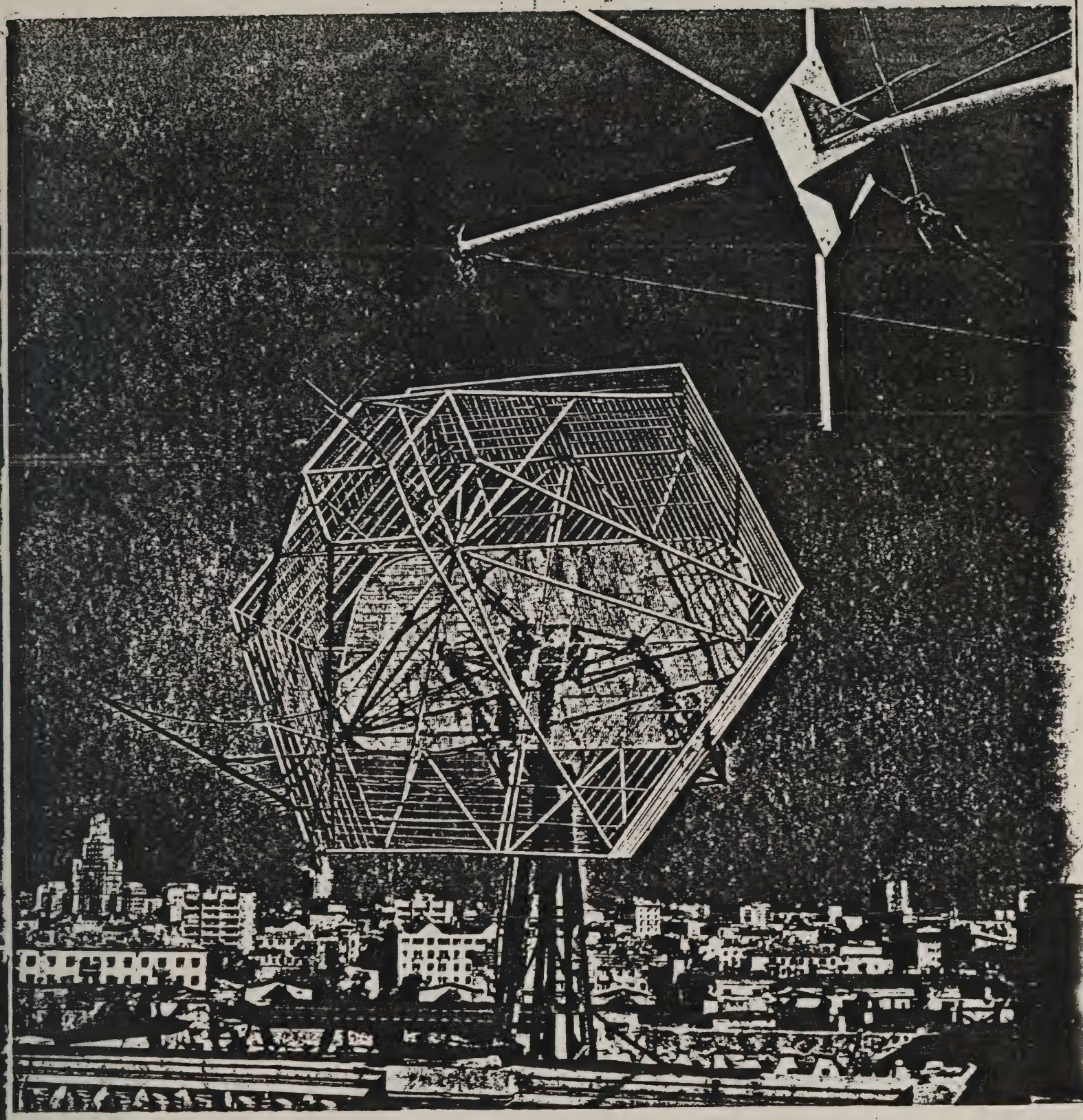


Fig. 3





RADIO

РАДИО 1

MONTHLY SCIENTIFIC-POPULAR RADIOTECHNICAL JOURNAL

ЕЖЕМЕСЯЧНЫЙ НАУЧНО-ПОПУЛЯРНЫЙ РАДИОТЕХНИЧЕСКИЙ ЖУРНАЛ

1982

/Front cover of January 1982 issue/

(CQ-U, continued from page 4)

VHF*UHF*SHF.

Ultrashortwave Competitions. On 1 - 2 August 1981, coinciding with "Field Day," the socialist countries held international ultrashortwave competitions in the city of Mogilev. The day before, Sovetskiy Patriot had promised favorable propagation conditions. RC2WBR had contacts with RA1ATS, UK5SAU, SP4DCS/4, RA1ARX, UB5DAR/p (810 km!), OH5LK, UK1CID, UK3DAB, and UK3XAM, and agreed with the prediction. RA3YCR had about 300 QSO from a field location, with stations in 53 locator squares in UA1, UC2, UA3, UB5, and UA6; he heard RO5OAA; his maximum distance was 765 km. UA3TCF was especially pleased over a QSO on 144 MHz with UK3XAM (590 km) and on 430 MHz with UW3CU (570 km). UB5ICR reports that the UK5IFC team made around 100 QSO's (31 + 16 QTH locators) /Editor's note: Unsure of meaning of parenthetical phrase, unless it signifies that UK5IFC worked stations in 31 QTH locator squares, 16 of them new ones for it./ UK6HAR: "This was our fourth mountain expedition -- they began in May 1979. But this time we selected Dzhumarukli Peak -- 3200m. There were six of us. All of our knapsacks were heavy, 45 kg each, and in our arms we carried antennas masts...by 30 July three of us were already at the peak. We installed ultrashortwave equipment there, and the 144 MHz band was full of stations, like 3.6 MHz. We worked UA6A's, L's, H's, UB5I's, M's, J's, Q', and E's. During the 430 MHz period we had only occasional contacts over distances of 400 - 550 km with UA6AEH, RB5QGL, UB5AC, and UK5IHF. On 144 MHz it was an entirely different matter: A mass of stations. We logged contacts with UK5EAS (734 km), UK5EAO (731 km), UK5EAA, UT5PI, UT5FC, and others. About 4 hours before the end of the competitions a thunderstorm forced us to cease operation and transfer to a reserve tent set up in a safe place. Results: 69 QSO's and 19 QTH-locators." UA9GL, UQ2GFZ, UA3AGX, and UC2AAB also sent in reports. The first USSR team was the winner (the second participated non-competitively), followed by the GDR, Ukraine, Bulgaria, Hungar , and Romania. The first Soviet team consisted of Yu. Grebnev, UA9ACN; G. Grishchuk, UC2AAB; S. Fedoseyev, UC2ABT; A. Vanchauskas, UP2BBC; S. Kezhelis, UP2BAR. The mainstay of the second team was the UK3AAC team: D. Dmitriyev, UA3AMW; V. Prokof'yev, RA3ACE; V. Simonov, UA3AGZ; A. Tarakonov, UA3AGX; V. Baranov, UT5DL, representing the Ukraine.

144 MHz - Meteors. The August Perseids are the strongest meteor stream of the year; increased activity assisted in the conduct of MS Activity Days by the editors of RADIO from 11 through 14 August. About 80 ultrashortwave stations from 36 oblasts operated during Perseids-81. UB5LIQ commented "The stream was very intensive. If the optimal other station for a given time was determined correctly, a QSO was practically 100% possible. Burst length reached one and a half minutes, which permitted contacts to be carried out even with normal sending speed." Whereas previously each new stream brought an average of four or five new stations using MS, this time the ranks of MS enthusiasts increased by more than 15 call-signs. RA3TDH, UA4CDT, UA4NDT, RB5ITR, UB5MPP, UK5IEC, UA6HIF, UK9CAM, UY5RG, RB5EHB, UR2QA, UR2RGM, UR2RIX, UK2RDX, UP2BJB, and UQ2GCG tried their hand at MS contacts for the first time. Two experienced ultrashortwavers share their experiences: UA3LBO: /Not sure I've got this right - Tr./ "...During, for example, a five-minute receive period for a sked. As soon as a regular burst begins, I listen 2 or 3 seconds later (this time is fully sufficient to record on the tape recorder all transmitted information at a speed of 600 - 800 characters per minute) to 144,200 kHz (where SSB station operate for CQ's), trying to pick somebody's call out of the usual pile-up. Then I call and immediately give the report... The burst isn't yet over, and the QSO is complete! Then I quickly decode what I have recorded on the tape recorder, 're-load' the keyer memory with new information, and continue the first contact... In this way contacts with YO2IS, YO1EU, DJ5EV (twice), and in all 21 QSO's were established!" UA9GL: "I have an ultrashortwave converter connected to two receivers, usually tuned to different frequencies, for example one to the sked frequency and the other to the CQ frequency. I record simultaneously on two channels using a 'Jupiter-201-stereo.' In this way I can keep track of the strength of the stream (based on the quantity of pings and bursts on 144,100 kHz) and the on-the-air situation." One particularly interesting QSO took place over a distance of 1380 km between UA9UKO and UL7GBD, the first from Siberia and the first from Central Asia! It was the first MS one for both operators, and did not come about easily -- they were successful only on their third try and after a year of trying.

p 23: "MS Activity Days." "Radio" prizes and diplomas were awarded to the following participants in this August 1981 event: V. Butuk, UO5OGF; Vl. Belevantsev, UA3-118-259; Vik. Belevantsev, RA3YCR; Ya. Nikker, UR2GZ; V. Yaz'min, UA3TBM; the team at observer point UA3-121-121; the team at UK6LDZ; V. Tsygankov, UA3LBO. UA3LBO placed tenth in the scoring among individual stations but had the greatest number of QSO's (19).

Sovetskiy Patriot, 1 January 1982, p2 (full text under photos):

In these first days of the new year Soviet radioamateur communication satellites are orbiting the Earth; they were built by creative collectives of DOSAAF radioamateurs.

Pictured are: Above: Regular communication session with the new "Radio" series satellites is conducted by management group leader B. Lebedev*, senior operator V. Ulybin, and consultant-designer A. Papkov; below: Reception-command Point operators Ye. Pavlova and B. Makarenko calculate the orbit of radioamateur satellites.

Sovetskiy Patriot, 6 January 1982, p 4 (full text):

RADIOAMATEUR SATELLITES IN FLIGHT

The satellites "Radio-3" -- "Radio-8," placed in space 17 December 1981, have made their first hundreds of rotations around the Earth. The Central Reception-Command Point of the Central Committee of DOSAAF/USSR is carrying out the reception and analysis of telemetry information arriving from on board each satellite. Amateur radiostations attached to the reception-command point are making more precise the orbital parameters. Operation by radioamateurs through the satellites' repeaters has begun; the period of experimentation continues for these.

According to the results of the processing of amateur radio measurements, the periods of rotation of the satellites and the displacement of rising orbital nodes are:

"Radio-3" -- 118.5 min./29.75°; "Radio-4" -- 119.4 min./29.95°; "Radio-5" -- 119.6 min./30.02°; "Radio-6" -- 118.7 min./29.80°; "Radio-7" -- 119.2 min./29.90°; "Radio-8" -- 119.8 min./30.07°.

Reference orbit No. 253 of 7.01.1982:

SATELLITE	RISING NODE TIME (GMT)	RISING NODE LONGITUDE
"RADIO-3"	0621	297°
"RADIO-4"	1002	347°
"RADIO-5"	1043	05°
"RADIO-6"	0712	309°
"RADIO-7"	0911	335°
"RADIO-8"	1142	17°

NOTE: Longitude of the rising node: To the west from zero meridian.

Subsequent orbits are determined by calculation.

The determination of areas of radio visibility and the tracing of the path of the satellite through an area are to be accomplished using the methodology for the satellites "Radio-1" and "Radio-2" (see "Radio" magazine No. 1/1979 "Constructing a tracing diagram," by V. Dobrozhanskiy). Questions on the operation of satellites "Radio-3" -- "Radio-8" and information concerning them may be directed to the address: 123362, Moskva, D-362, Volokolamskoye shosse, d. 88, FRS SSSR.

FEDERATION OF RADIOSPORT OF THE USSR.

Sovetskiy Patriot, 10 January 1982, p 2 (full text):

RADIOAMATEUR SATELLITES IN FLIGHT

The satellites "Radio-3" and "Radio-4" are operating in a mode /v rezhime/ of 'round-the-clock transmission of telemetry information with radiobeacon power raised to 1 Watt, on the frequencies: "Radio-3" -- 29,320 kHz; "Radio-4" -- 29,360 kHz.

The repeaters on the satellites "Radio-5," "Radio-6" "Radio-7,"and "Radio-8" have paired common frequency segments: "Radio-5"and "Radio-6" -- 145,910 - 145,950 kHz (Earth to Space), 29,410 - 29,450 kHz (Space to Earth); "Radio-7" and "Radio-8" -- 145,960 - 146,000 kHz (Earth to Space), 29,460 - 29,500 (Space to Earth), and therefore simultaneous operation in a common radiovisibility zone is permitted only for two repeaters in different frequency segments. When the satellites "separate" and when they subsequently fly through

*Probably Boris M. Lebedev, UA3ADI, who demonstrated a transceiver designed for satellite communication at an ITU-sponsored exhibit in Geneva in September 1979.

the /radiovisibility/ zone, all four repeaters can operate without mutual interference.

Beacons are operating with reduced power (0.1 Watt) on the repeater satellites, transmitting telemetry information on the frequencies: "Radio-5" and "Radio-6" -- 29,450 kHz; "Radio-7" and "Radio-8" -- 29,500 kHz. In addition, radiobeacons can operate on satellites "Radio-6" and "Radio-8" on the frequencies 29,410 kHz and 29,460 kHz respectively.

An experimental period is continuing for the repeaters, during which operation takes place, as a rule, with reduced sensitivity.

Automatic operators -- robots -- are located in satellites "Radio-5" and "Radio-7" only. They operate on the frequencies: "Radio-5" -- 145,826 kHz (Earth to Space), 29,331 kHz (Space to Earth); "Radio-7" -- 145,835 kHz (Earth to Space), 29,341 kHz (Space to Earth).

FEDERATION OF RADIOSPORT OF THE USSR

Sovetskiy Patriot, 13 January 1982, p 4 (full texts). Edition No. 1 /corresponding to January - Tr./ of column "Radioamateurs' Club EFIR /AIRWAVES/":

/Translator's note: All of the articles translated are included in the "EFIR" column and relate to the launching, on 17 December 1981, of six additional amateur radio satellites by the Soviet Union. Two other short articles in the column unrelated to the RS satellites are not translated, nor is this edition, No. 916, of Boris Stepanov's (UW3AX) column "On the Amateur Bands."/

THE "RADIO" SATELLITES AND OPERATING WITH THEM

The amateur satellites "Radio-3" - "Radio-8," placed in orbit 17 December 1981, have on board an array of technical radio equipment permitting the conduct of experiments and of sport communications via a space repeater.

The new satellites differ in comparison with the first artificial Earth satellites RS1 and RS2 in their more advanced power supply, heat-regulation, and telemetry systems, their increased capability with respect to frequency band, and in the sensitivity of the repeater. Besides radiobeacons and a repeater, the on-board array of the new artificial Earth satellites /in Russian ISZ for iskustvennyy sputnik Zemli, literally artificial satellite of the Earth; hereafter to be translated simply "satellite" - Tr./ includes an automatic answerer -- a robot, an on-board robot log, and an operational memory for circular announcements (bulletin board).

Radio Beacons. The satellites RS5 - RS8 each have two beacons for general use. The basic beacon is intended for the transmission of telemetry on the status of on-board systems. It is situated at the upper border of the repeater passband. The power of these amounts to 0.1 Watt. They transmit an alphanumeric text in Morse code at a speed of 50 - 90 charters per minute. When monitoring such a beacon, an operator should know that a repeater passband stretches out for 40 kHz below it. On RS6 and RS8 there are additional beacons, situated at the nower border of the repeater passband. These beacons have two power levels, switched on command from Earth: 0.1 or 1.0 Watt.

Satellites RS3 and RS4 each have one telemetry beacon with a power of 1 Watt.

Repeaters. Repeaters, analogous to repeaters in RS1 and RS2, are installed on board RS5 - RS8. They are calculated for a maximum power of 1 - 1.5 Watts and have a free, multi-station access in a 40 kHz passband with linear spectrum transfer from the 2-meter to the 10-meter band in real time. The repeaters have two sensitivity levels that can be changed on command from Earth: Maximum and reduced by 10 dB.

Robot. This is an electronic logic device with memory, which can recognize calls acceptable in radioamateur practice, answer them, transmit control numbers, record in memory (in the on-board log) the call-signs and numbers, and also, on command from Earth, "dump" information from the on-board log to Earth for control of the contacts made and the making out of QSL cards. The capacity of the on-board log is 64 contacts. The capacity of the control number memory is 1000. After the filling of the on-board log and the dumping of the information to Earth on command from Earth, the erasure of the log's contents takes place. When this is done, the order of numbers can continue to be transmitted, up to the number 999, after which, again on command from Earth "zero-ing" of the

/from Sovetskiy Patriot, 13 January 1982, EFIR column No. 1, continued:/

numbers takes place. The robot receives calls and carries out communications in Morse Code, and by the way can operate at different sending speeds depending on the speed of the call. It answers beginners, of course, at a low rate of speed, and aces at a high one. An invitation to establish communication with the robot of "Radio-5," for example, is transmitted by it with the following text: /This and subsequent sample texts are printed in Latin letters, in English - Tr./ CQ CQ DE RS 5 QSU ON FQ 145830 KHZK /sic/. The RS7 robot announces a frequency of 145840 KHZ.

A call to the robot by an Earth station must consist strictly of the following four words:

Call-sign of the robot -- DE.

One's own call-sign -- AR (sent together).

For example: RS5 DE UA3XBU AR. The transmission must be clear and without error. Otherwise one can receive the reply: QSD, RPT, QRS, QRQ or no answer at all. The text of the call is repeated for purposes of control on the frequency of the call. In tuning the transmitter to the frequency of the robot's receiver, it should be taken into account that the receiver of the robot has a narrow passband, and it is necessary to make a correction for the doppler frequency shift. The maximum amount of this shift for an overhead orbit for a rising and descending satellite is approximately plus or minus 3 kHz.

The answer of the robot consists, for example, of such a text: UA3XBU DE RS5 UR NR 012 UA3XBU DE RS5 UR NR 012 OP ROBOT TKS FR QSO 73 SK. With that the communication is ended.

The bulletin board serves for the transmission of circular announcements, principally concerning operational modes and procedures for the satellites, information from the Central Reception-Command Point, and so forth. The capacity of the memory is 20 words. Transmission may take place on the frequency of the second or first beacon, in Morse code.

Receiving apparatus on Earth. The signal level for RS3 - RS8 are the same as for RS1 and RS2 in their day. In connection with the fact that the satellites are not oriented in space, the signal level at the input of Earth receivers changes as a consequence of rotation of the satellites and uneven directivity patterns of their antennas. This especially affects the repeater mode, even with reduced repeater sensitivity. In order to avoid loss of information, it is recommended that special attention be paid to the receiving side of equipment and to receiving antennas. Receivers should have a sensitivity of not less than 0.5 mV. Antennas should preferably be directional, with a gain ratio of not less than 6 dB and maximum possible protection parameters. Satisfactory reception of the beacons, especially when operating with increased power, is possible with simple wire antennas and simple receivers with a sensitivity of 1 - 2 mV. It is recommended to carry out experiments with antennas with different polarizations: Linear, horizontal, and vertical, and also elliptical with various directions of rotation of the polarization plane.

Transmitting apparatus on Earth. The effective radiated power in the direction Earth to Space must be determined by the basic rule: The level of one's own signal, having gone through the repeater, should not exceed the signal level of the telemetry beacon. Otherwise overloading of the repeater may occur, which negatively affects the operation of other stations. Transmitters with regulated power are recommended. For purposes of illustration, when working through a satellite located overhead, the power should be 10 times less than when the satellite is located near the horizon. The same sort of experiments is recommended with transmitting antennas as with receiving ones. The preferred mode of operation is CW.

When working the robot the maximum value of radiated power is not in principle significant, since the robot's receiver has a threshhold detector. Below a certain power at the input of the receiver the signal regenerated by the robot will have a "broken-up" character, which signifies that the Earth transmitter has insufficient power.

A special article will be devoted to the telemetry system and the reception of telemetry information.

In conclusion, let us note that in the initial stages of the existence of the satellites numerous verifications of parameters and satellite systems are being carried out. Therefore, any reports or remarks concerning the operation of the radio systems will be of great interest to the designers. Please report on the results of your experiments to the FRS USSR or to the editorial board of "Radio" magazine.

COMMITTEE FOR SATELLITE COMMUNICATION, FRS USSR

/from Sovetskiy Patriot, 13 January 1982, EFIR column No. 1, continued:/

CONGRATULATIONS!

Congratulations to the creators of the "Radio" series of radioamateur satellites and to all radioamateurs in the Soviet Union, on the new success in space. The six satellites were placed in orbit in a very timely fashion. Space radiocommunications have been activited anew. Radioamateurs of the whole world have the possibility of completing attractive voyages.

With comradely greetings, A. Gshvindt (HA5WH), chairman of the Hungarian Radioamateurs' Union and of the Radioamateur Satellite Working Group of Region 1, IARU. /Translator's note: The above spelling of the sender's name results from transliteration into the Cyrillic alphabet and then back again to the Latin alphabet. A recent Call Book gives his name as Dr. Andras Gschwindt./

DIPLOMAS AWAIT YOU

Among radioamateurs of the whole world, wide popularity has been earned by diplomas /translator's note: In English, the word "certificate" would often be used rather than "diploma"/ issued by the Federation of Radiosport of the USSR and by the Central Radioclub of the USSR named after E. T. Krenkel' -- "R-15-R," "R-10-R," "R-100-O," "W-100-V," and others. Fulfilling the conditions for all these diplomas prior to the launching of radioamateur satellites was possible only on short wave. Now it has become technically possible to realize distant radiocommunications on ultrashort wave and consequently to fulfill the conditions for the diplomas on ultrashort wave as well.

The only condition for being able to fulfill them is becoming the presence of the necessary number of amateur ultrashortwave stations in the republics and oblasts, operating via repeater satellites.

The FRS of the USSR, at the suggestion /? - po predstavleniyu/ of the satellite communication committee of the federation, already at the time of the launching of the first experimental satellites "Radio-1" and "Radio-2" (October 1978) decided to issue (with an appropriate sticker) international diplomas of the FRS USSR and of the CRC USSR to all applicants fulfilling the conditions for the diplomas using ultrashortwave radiocommunication via repeater satellites. This decision was intended to increase interest on the part of radioamateurs in this new form of radiocommunication.

We briefly remind readers of the conditions for receiving the diplomas:

"R-15-R" -- contact radiostations in all fifteen republics of the Soviet Union within 24 hours,

"R-10-R" -- contact radiostations of the ten radioamateur areas of the Soviet Union within 24 hours,

"R-100-O" -- contact 100 different radiostations of the Soviet Union,

"RAEM" -- accumulate 68 QSO points for working Soviet radioamateur stations located beyond the Arctic and Antarctic Cirles.

The issuance of the diplomas takes place in accordance with the procedure laid down by the FRS USSR. Diplomas are issued to observers /SWL's - Tr./ under analogous conditions.

Counted are QSO's established via the "Radio" satellites beginning 26 October 1978.

FEDERATION OF RADIOSPORT OF THE USSR

FIRST SPACE QSO's

The newspapers hadn't had time to come out yet with the official announcement on the launching of the amateur communication satellites, but already the radioamateur world, the enthusiasts of space communications had heard their call-signs, had recorded signals they had received, were making guesses, were analyzing. The only thing that was going on in the European and North American AMSAT NETs was discussion of the new event in space.

But now the first orbital measurements have been made. This work was done scrupulously and with great accuracy and sense of responsibility by I. Naroditskiy (RA9MBN) from Omsk, a veteran radioamateur communication. Computers and calculators began to operate in Holland -- PAØDLO, England -- G3IOR, and in the USA -- K1HTV.

Vasil Terziyev (LZ1AB) told the Swede Andy (SMØDZL): "I received a letter from a friend, began to unseal it, tore off the corner /?/ and suddenly heard the call-sign RS and telemetry from the radiobeacon. This stunned me so much that only now, two hours later, I remembered about the letter."

/from Sovetskiy Patriot, 13 January 1982, EFIR column No. 1, continued:/

But now the repeaters have been switched on. The first "historic" communications were made by Moscovites UV3FL, UW3HV, UK3ACM, by far easterners UKØLAT, UAØLFK, RAØLFI, and others. A. Pan'kov (UA1CNA) from Leningrad Oblast' awaited the appearance of the RS's with impatience. Already two months ago he told me he was ready for the RS's to go up. And now it's hard to "catch" an orbit during which his call-sign is not heard. The following joined in to operate: UB5MGW, UA9CKW, UW4NI, UD6DFD, UA9FAD, UA9FDZ, UL7DD, and many foreigners. The call-signs of the majority of them are well known from the time of the operation via RS1 and RS2. These are experienced radioamateurs, possessing good and complex equipment.

But why is the "average" radioamateur not heard? I listen to telemetry channel "IG" and it's giving the number 10. This means that the repeaters are switched to reduced sensitivity. In the initial period of the satellites' flight this is necessary. All of the systems are not yet finally verified. Correction of operational modes is possible. Thus, for example, strong QSB lowers operational performance and clarity of speech.

OK, but how about the robot? We read what is registered: UV3FL -- 01, UW3HV -- 02 (Moscow), K8E /sic - Tr./ -- 03 (USA), PY2FFC -- 10 (Brazil), G3IOR -- 46 (England). We see W, KA, DL, HG, JS, UAØ, RAØ. The last QSO -- No. 57 -- belongs to W1NU -- owner of the "Space" diploma and the publisher of the AMSAT bulletin. He received this diploma for communications via RS1 and RS2.

I listened for a long time while R. Suvorova (UW4NI) tried to communicate with the robot. It didn't answer, not only on account of lots of interference, but principally on account of separated transmission of the signal AR. A mistake made by many. Finally, on the next orbit everything was done correctly and a QSO took place.

L. LABUTIN (UA3CR)
Master of Sport of the USSR,
Laureate of the Leninist Komsomol Prize

Sovetskiy Patriot, 17 January 1982, p 4 (full text):

RADIOAMATEUR SATELLITES IN FLIGHT

As of the present time the communication satellites "Radio-3" - "Radio-8" have, on account of their different periods of rotation, separated over time, and this separation will increase in the future. For this reason it is more convenient to specify the times of the passage of the satellites through the radiovisibility zone not by orbit numbers but by the rising nodes of each satellite, beginning with the first node at the beginning of each day.

Subsequent rising nodes for each orbit are obtained by adding the period of rotation to the preceding node, and by adding the value of the displacement of the rising node of a given satellite to the longitude. Preliminarily, to obtain data for purposes of orientation, the period of rotation for all satellites in the system "Radio-3" - "Radio-8" can be taken as equal to 2 hours, and the longitude displacement of the rising node as 30°. To obtain precise values it is necessary to make corrections, given in the table for one of the twelve orbits.

CONTROL ORBITS FOR 17.01.82

Satellite	Orbit Number	Time of Rising Node (GMT)	Longitude of Rising Node	Calculation Corrections			
				Per single orbit		Per 12 orbits	
				Time in Minutes	Longitude	Time in Minutes	Longitude
"Radio-3"	372	0124	234°	-1.47	-0.25°	-17.7	-3°
"Radio-4"	369	0050	226°	-0.6	-0.05°	-7.2	-0.6°
"Radio-5"	369	0149	240°	-0.44	+0.02°	-5.3	+0.24°
"Radio-6"	371	0038	223°	-1.28	-0.2°	-15.3	-2.4°
"Radio-7"	370	0136	238°	-0.8	-0.1°	-9.6	-1.2°
"Radio-8"	368	0107	230°	-0.2	+0.07	-2.4	+0.84°

/from Sovetskiy Patriot, 17 January 1982, continued:/

For example, for the satellite "Radio-3," the rising node of the following orbit (No. 373) will be specified for orientation purposes as 0324 hours and 264° and taking account of corrections as 0322.5 and 263.75°. For satellite "Radio-5," the rising node 24 hours later, that is 12 revolutions later (orbit No. 381): For orientation purposes 0349 hours and 270° and with corrections 0343.7 hours and 270.24°. In this case the date must be changed correspondingly.

The system proposed ensures fully adequate precision for short-term forecasting (up to 10 to 15 days).

Data on rising nodes for any orbit in the course of a 24-hour period or week can be determined in similar fashion. In this case, the number of periods and the correction must be taken corresponding to the number of orbits.

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/ Translator's note: K1HTV informs me "ascending node" is the proper term in English, not "rising node"; we'll use the former term in the future and hope anyone using the translations up to this point will make the conversion. /

Sovetskiy Patriot, 24 January 1982, p 4 (full text):

RADIOAMATEUR SATELLITES IN FLIGHT

The flight of satellites "Radio-3" - "Radio-8" is continuing; they have already completed more than 450 revolutions.

CONTROL ORBITS FOR 25.1.82

Satellite	Orbit Number	Time of Ascending Node	Longitude of Ascending Node
"Radio-3"	469	0101	240°
"Radio-4"	466	0152	253°
"Radio-5"	465	0107	241°
"Radio-6"	468	0035	233°
"Radio-7"	466	0020	230°
"Radio-8"	464	0045	239°

Subsequent ascending nodes are determined by adding the period of rotation to the preceding node and by adding the value of the ascending node displacement of a given satellite to the longitude. These are: "Radio-3" -- 118.52 minutes and 29.75°; "Radio-4" -- 119.39 minutes and 29.97°; "Radio-5" -- 119.55 minutes and 30.02°; "Radio-6" -- 118.72 minutes and 29.8°; "Radio-7" -- 119.2 minutes and 29.92°; "Radio-8" -- 119.76 minutes and 30.06°.

When using the calculation method laid out in the column "Radioamateur Satellites in Flight" ("Soviet Patriot" of 17.1.82), the ascending node of orbit No. 381 for the satellite "Radio-5" for orientation purposes is 0149 and 240° and with correction 0143.7 and 240.24°.

The refinement of orbital data offering the possibility of long-range forecasting is continuing.

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Sovetskiy Patriot, 31 January 1982, p 4 (full text):

RADIOAMATEUR SATELLITES IN FLIGHT

The carrying out of orbital measurements on each of the six radioamateur satellites "Radio-3" - "Radio-8" is one of the most responsible and interesting tasks accomplished by radioamateurs from the first days following the launch of the satellites. Thanks to these measurements, data were received in the course of the first days of the satellites' flight, data that were published by the FRS of the USSR as they were refined and which are initial data for defining the times of passes during a current 24-hour period and subsequent days of the week.

However, the precision of the data received by radioamateurs is still insufficient for long-range prediction and the making of calculations that will be necessary in the future. In connection with this, the FRS of the USSR is announcing in February of this year a contest (competition) for defining (measuring) the orbital parameters of the "Radio-3" -

/from Sovetskiy Patriot, 31 January 1982, continued:/

"Radio-8" satellites (period of rotation, time and longitude of ascending nodes), with sufficient precision to permit prediction over a six-month period.

Radio amateurs and collectives of educational institutions (Soviet and foreign) may take part in the contest. We request that measurement data accompanied by a short description of the methodology of measurement be sent by 15 March (postmark) to the address: 123362, Moskva, Volokolamskoye shosse, d. 88, stroyeniye 8, FRS SSSR.

Those taking the first three places on the precision of the measurements made will be awarded diplomas /certificates/ and special prizes offered by "Radio" magazine.

FEDERATION OF RADIOSPORT OF THE USSR

/ An acceptable English-language version of the address given in the second-to-last paragraph above would be: Federation of Radiosport of the USSR
88 Volokolamskoye Shosse, Building 8
123362 Moscow USSR /

Separate article just above preceding one in 31 January 1982 edition of Sovetskiy Patriot (full translation):

TO THE FEDERATION OF RADIOSPORT OF THE USSR

IARU Headquarters congratulates the radioamateurs of the USSR on an outstanding achievement: The simultaneous launching of six amateur satellites. This event has evoked great interest among radioamateurs throughout the world.

President of the International Amateur Radio Union
Noel B. Eaton (VE3CJ).

Sovetskiy Patriot, 14 February 1982, p 4: Continuation of "RADIOAMATEUR SATELLITES IN FLIGHT" series of articles. Contains following reference orbit data for 15 February 1982:

"Radio-3"	724	0043	269°	"Radio-6"	723	0108	275°
"Radio-4"	719	0120	278°	"Radio-7"	720	0056	272°
"Radio-5"	718	0115	277°	"Radio-8"	717	0145	284°

The figures given for determining subsequent ascending node data are the same as those given in the 24 January article except that the minutes are carried out to a third decimal place: 118.519, 119.395, 119.555, 118.718, 119.197, and 119.765. The article closes with a request from the USSR Federation of Radio Sport to radioamateurs and educational institutions to take active part in the joint contest in determining precise orbital parameters for long-range prediction.

NOTE TO 24 JANUARY AND 31 JANUARY ARTICLES REGARDING TIMES GIVEN: The unfamiliar abbreviation MT is used -- the letters are the same in the Latin and Cyrillic alphabets. The only meaning that readily comes to mind is Moscow Time, which, however, is usually abbreviated MSK (presumably Moskovskoye Vremya or Moskva). Moscow Time = UTC + 3. Can anyone receiving this summary translation clarify, based on known orbital data, whether Moscow Time is meant? If so, not only the times will have to be changed to correspond to UTC, but the date will have to be changed to one calendar day earlier (late the preceding evening).

Sovetskiy Patriot, 24 February 1982, p 4, Column "On the Amateur Bands" No. 920, under "Club News" heading: From 3 through 5 March "activity days" will take place under the auspices of the radioamateurs of Magadanskaya Oblast' Those who during these days establish the greatest quantity of contacts with Magadan Oblast' (repeat QSO's are counted on different bands, and on the same band using a different radiation mode) will be awarded prizes and diplomas. The awarding will take place in three subgroups (collective stations, individual stations, observers), separately for the 1st, 2nd, and 3rd through 5th call-sign districts. Observers must not show the same call-sign of a Magadan radioamateur before having made five other observations. In case of ties in the number of contacts, preference will be given to sportsmen who carry out the greatest numbers of contacts with the 139th oblast'. Extracts from logs are to be sent off not later than 20 March to the address: 685024, Magadan, ab/yashch 1691 ("dni aktivnosti"). Submitted by Yu. Balabanov (UAØIBB), responsible secretary of the Magadanskaya FRS. /NOTE: An acceptable English-language form of the above address would be: Activity Days, P. O. Box 1691, 685024 MAGADAN, USSR./

(end)